IN THE SPECIFICATION

Please amend page 1 by inserting the following heading between the title of the invention and the first paragraph:

"FIELD OF THE INVENTION"

Please amend page 1 by inserting the following heading between the first and second paragraphs:

"BACKGROUND OF THE INVENTION"

Please amend page 3 by inserting the following heading after line 12 and before line 13:

"BRIEF SUMMARY OF THE INVENTION"

Please amend page 8 by inserting the following heading after line 20 and before line 21:

"BRIEF DESCRIPTION OF THE DRAWINGS"

Please amend page 9 by inserting the following heading after line 9 and before line 10:

"DETAILED DESCRIPTION OF THE INVENTION"

Please amend page 15 by inserting the following language between the "CLAIMS" heading and claim 1:

"I claim:"

Please amend page 9 by inserting the following text beginning on line 12 as follows:

"Referring to the drawings, in Figure 1 there is shown a schematic representation of a conventional gas treatment unit for exhaust gases from a semi-conductor device manufacturing plant. The exhaust gas is the gaseous effluent or by-product(s) from any production procedure and the safe disposal of which or of a component of which is to be achieved. If the exhaust gas or the relevant component thereof is in a form suitable for

dissolution in water and for subsequent treatment according to the method of the invention, then preliminary treatment of the exhaust gas may be unnecessary. For example, when the exhaust gas itself contains oxides of phosphorus, the gas scrubbing unit serves to effect dissolution of those oxides of phosphorus to produce aqueous phosphates and/or phosphites.

In the alternative, when the exhaust gas contains water-insoluble materials such as fluorocarbons or CFCs, it will be necessary to employ a combustor, plasma reactor or other reaction unit in order to convert those water-insoluble materials into water-soluble form. Fluorocarbons, for example, may be converted into HF in this manner, and HF dissolves readily in water in the gas scrubbing unit to generate hydrofluoric acid.

The exhaust gases may contain many varied species including halogen-, phosphorous-, silicon- and boron-containing compounds. The exhaust gases or the products of their preliminary reaction..."

Please amend page 14 by inserting the following text beginning on line 19 as follows:

"It will be understood that this alternative example of an ion adsorption unit consisting of ion exchange material is, in operation, self-regenerating in that it effectively transports the captured cations and/or anions through its bulk for discharge as a concentrated aqueous solution, and will regenerate to its hydrogen or hydroxide form when no other cationic or anionic species is present. Such an electrically regenerating ion exchange unit is known as an ERIX unit. Such units may comprise many ion removal and concentration channels in parallel and will be known to those skilled in the art.

The ion absorbing materials serve to capture the ions of interest and are preferably ion exchange materials such as ion exchange resin in the form of particles or beads or other materials that can provide:

a solution permeable medium;

an ion adsorption medium (to remove the anions or cations);

an ion conducting medium whereby the ions may be moved by the imposed electrical field into a separate solution.

The particles or beads of the resin are preferably in a coherent form, that is to say they are not mobile or loose, but are constrained in a predetermined configuration. For example, the particles or beads may be bound together with a binder or held between layers of a mesh or membrane, so as to be permeable to the aqueous solution containing the ions. The electrical potential which is applied across, for example, the thickness of the layer of ion

absorbing material serves to drive the captured ions through the ion absorbing material towards one or other of the electrodes through which the potential is applied. The electrical potential may be generated from a pair of electrodes arranged to form an electrolysis cell or by any alternative arrangement, for example in the form of an electrophoresis cell.

It has been found that using the method and apparatus according to the invention, it is possible to effect continuous separation of anions and/or cations within a closed loop circulation system such as that used for gas scrubbing, without any need for regenerating or periodically replacing the ion absorbing means: The efficiency of the method and apparatus will depend upon the nature of the ion absorbing means and of the ion or ions to be captured, the concentration of the ion or ions in the solution and other factors such as flow rates and electrical potential but initial indications are that ion extraction rates of up to 98% per pass can be achieved.

With such high extraction rates, the removal of acid cations such as F^-, SO_4^{2-} and NO_3^- will have a dramatic effect upon improving the service life of the equipment in the circulation system, such as pumps, meters, valves and baffles.

The method of the invention is applicable to a wide variety of cationic species such as sulphate, sulphite, nitrate, nitrite, phosphate, phosphite and halides, that is to say fluoride, chloride, bromide and iodide, as well as anionic species, especially metals and more especially heavy metals.

The invention does, however, have particular applicability to fluoride such as that generated as a by-product of the semi-conductor manufacturing industry and which produces aqueous hydrofluoric acid as a result of reaction followed by dissolution in a gas scrubbing unit.

It has unexpectedly been found that the ions stripped from the aqueous solution do not re-enter the aqueous circulation stream that continues to flow, for example, across the surface of the ion absorbing material. Although the gas scrubbing operation will generally be carried out on a continuous basis, the acid content of the gas entering the scrubber may be variable and may often be totally absent. This means that the fluoride ion content of the water passing across the surface of the ion absorbing material is correspondingly variable. The fact that the captured ions are transported away from the surface of the ion absorbing material under the influence of the applied electrical potential removes those ions from being resolubilized by the water. This represents a significant improvement in ion absorption efficiency.

Compared to the example given above of a closed loop gas scrubbing system resulting in aqueous HF operating at a recirculation rate of 25 l/min and consuming about 6 l/min fresh water, a similar system incorporating the features of the present invention has been shown in initial trials to be capable of achieving up to a 30-fold reduction in the fresh water requirement."

Please cancel the text beginning on page 5, line 13 through page 8, line 20 as follows:

"In another preferred embodiment the ion absorbing means may comprise a water permeable zone of an ion absorbing material.

~~The exhaust gas is the gaseous effluent or by-product (s) from any production procedure and the safe disposal of which or of a component of which is to be achieved. If the exhaust gas or the relevant component thereof is in a form suitable for dissolution in water and for subsequent treatment according to the method of the invention, then preliminary treatment of the exhaust gas may be unnecessary. For example, when the exhaust gas itself contains oxides of phosphorus, the gas-scrubbing unit serves to effect dissolution of those oxides of phosphorus to produce aqueous phosphates and/or phosphites.~~

~~In the alternative, when the exhaust gas contains water-insoluble materials such as fluorocarbons or CFCs, it will be necessary to employ a combustor, plasma reactor or other reaction unit in order to convert those water-insoluble materials into water-soluble form. Fluorocarbons, for example, may be converted into HF in this manner, and HF dissolves readily in water in the gas scrubbing unit to generate hydrofluoric acid. The ion absorbing materials serve to capture the ions of interest and are preferably ion exchange materials such as ion exchange resin in the form of particles or beads or other materials that can provide: a solution permeable medium; an ion adsorption medium (to remove the anions or cations); an ion conducting medium whereby the ions may be moved by the imposed electrical field into a separate solution.~~

~~The particles or beads of the resin are preferably in a coherent form, that is to say they are not mobile or loose, but are constrained in a predetermined configuration. For example, the particles or beads may be bound together with a binder or held between layers of a mesh or membrane, so as to be permeable to the aqueous solution containing the ions. The electrical potential which is applied across, for example, the thickness of the layer of ion absorbing material serves to drive the captured ions through the ion absorbing material towards one or other of the electrodes through which the potential is applied.~~

~~The electrical potential may be generated from a pair of electrodes arranged to form an electrolysis cell or by any alternative arrangement, for example in the form of an electrophoresis cell.~~

~~It has been found that using the method and apparatus according to the invention, it is possible to effect continuous separation of anions and/or cations within a closed loop circulation system such as that used for gas scrubbing, without any need for regenerating or periodically replacing the ion absorbing means. The efficiency of the method and apparatus will depend upon the nature of the ion absorbing means and of the ion or ions to be captured, the concentration of the ion or ions in the solution and other factors such as flow rates and electrical potential but initial indications are that ion extraction rates of up to 98% per pass can be achieved.~~

~~With such high extraction rates, the removal of acid cations such as F-, SO42- and NO3- will have a dramatic effect upon improving the service life of the equipment in the circulation system, such as pumps, meters, valves and baffles.~~

~~The method of the invention is applicable to a wide variety of cationic species such as sulphate, sulphite, nitrate, nitrite, phosphate, phosphite and halides, that is to say fluoride, chloride, bromide and iodide, as well as anionic species, especially metals and more especially heavy metals.~~

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